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RESEARCH NOTE
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HYBRID POPLARS ON OHIO SPOIL BANKS

Hybrid poplars grow rapidly and are widely planted in Europe (Schreiner 1959). But they have received little attention in the U.S. despite our wide use of native cottonwood and aspen for pulp and paper. The apparent cause for their neglect is that they need intensive care during plantation establishment, in particular much cultivation or mulching to control weed competition. Costs of such work have discouraged extensive planting in this country.

Weeds usually do not cause as much trouble on strip-mined areas as they do on other sites. But poplars still have not been widely planted on strip-mined areas. This may be because little planting stock has been available, markets for poplar timber are sometimes weak, and poplars are considered intolerant to the low pH found on some spoils. But poorly as hybrid poplars perform on strongly acid spoil banks, Pennsylvania plantings described by Hart and Byrnes (1960) show that they grow well on moderately acid and neutral banks. Whereas survival ranged from none to only 20 percent on strongly acid plots of pH 3.2 to 4.0, it increased to 44 to 90 percent on less acid plots of pH 4.0 to 5.0. Similarly, we have found several hybrid poplars that survive and grow very well on mildly acid to neutral spoil banks. We feel that they should be seriously considered for planting on such areas.

In 1951, we began a trial of fifty hybrid poplar clones in Harrison County, Ohio, in cooperation with the Northeastern Forest Experiment Station of the U.S. Forest Service, the Ohio Reclamation Association, and the Hanna Coal Company. The plot layout used was that described in the Northeastern Station's working plan for hybrid poplar trials (Schreiner 1950) so it is identical to the layout used by that Station and its cooperators for other trials.

For our Ohio trial, sixteen stem cuttings of each clone were planted in plots assigned at random in two side-by-side blocks on each of two different strip-mined areas. The sites are:

Coal mined	pH	Soil-sized particles (less than 2 mm. diam.) (Percent)	Gravel (Percent)	Stone (Percent)
Pittsburgh	7.0-7.5	35-45	50-60	5
Sewickley	5.5	30-40	40-50	20

Both areas had been graded 2 years before the 1951 planting and vegetation was sparse on the plots.

The hybrid poplar stem cuttings planted were 12 inches long and 3/16 to 1/2 inch in diameter, somewhat longer but slightly less stocky than cuttings that rooted and grew best for Günther (1956) who tried four different sizes. Our cuttings were planted with a dibble and spaced 4 by 4 feet with about 4 inches of the cutting remaining above ground. After 8 years, we thinned the plantations by cutting all trees in every other row.

RESULTS

Generally, hybrid poplars survived better and grew faster on Sewickley than on Pittsburgh spoils (table 1). We are not sure why growth differed between the two types of spoil banks, but we speculate that it is influenced by spoil texture, i.e., permeability and aeration. The greater amount of soil-sized particles and the lesser amount of stone in the Pittsburgh banks would seem to be advantageous. But these banks are made up mostly of limestone and clay and fall into the compact impervious category described by Limstrom (1960). Pittsburgh spoil also seems heavy and breaks into large clods when dug up. In contrast, Sewickley spoil is chiefly shale and sandstone and the banks seem to be more permeable; the spoil we have dug is crumbly. Especially because they were graded, the Pittsburgh banks may well have been too compact for most poplars to grow satisfactorily. The importance of this aspect of poplar culture has been suggested by Rowland and Budden (1961).

Weed competition may also explain some differences in growth between the two areas. The Pittsburgh banks had some cover at the time of planting, and grass and herbs now cover one-third to one-half of their surface. The Sewickley banks still have almost no

Table 1.--Height and survival of selecte

Clone number[1]	Parentage	Height		S
		Pitts.	Sewick.	Pit
NE-8	P. nigra L., black poplar x P. laurifolia Ledeb.	17.5	17.3	8
NE-21	P. nigra L. cv. Charkowiensis x P. nigra L. cv. Caudina	23.3	25.5	1
NE-26	P. nigra L. cv. Charkowiensis x P. x berolinensis Dipp.	20.3	25.4	3
NE-42	P. maximowiczii Henry x P. trichocarpa Torr. & Gray	11.8	25.3	3
NE-46	P. maximowiczii Henry x P. x berolinensis Dipp.	15.0	24.7	6
NE-50	P. maximowiczii Henry x P. x berolinensis Dipp.	19.3	30.5	7
NE-52	P. maximowiczii Henry x P. nigra L. cv. Plantierensis	20.5	24.8	6
NE-224	P. deltoides Bartr. x P. nigra L. cv. Caudina	21.0	26.2	5
NE-225	P. deltoides Bartr. x P. nigra L. cv. Caudina	20.0	21.8	5
NE-226	P. deltoides Bartr. x P. nigra L. cv. Caudina	24.4	30.0	1
NE-239	P. deltoides Bartr. x P. nigra L. cv. Volga	16.2	21.7	8
NE-311	P. nigra L. cv. Charkowiensis x P. nigra L. cv. Caudina	23.5	24.1	8
NE-312	P. nigra L. cv. Charkowiensis x P. nigra L. cv. Caudina	26.0	28.0	5
NE-316	P. nigra L. cv. Charkowiensis x P. x canadensis Moench cv. Robusta	23.9	24.5	4

[1] The "NE" numbers designate Northeastern Forest Experiment Station clones that have be
[2] Based on trees remaining after thinning by removal of alternate rows.

understory vegetation. Greater vegetation on Pittsburgh banks may have provided enough competition during the first 2 or 3 years to reduce growth and survival of more intolerant poplar clones.

Several of the fourteen poplars that grew best in our plots were hybrids that Eschner (1960) listed as doing well in West Virginia. He found that clones 46 and 50 grew the fastest of fifty clones planted on a bottom-land site northeast of Parsons, West Virginia; and they were also two of our best. Similarly, clone 42 that grew very well on nursery soil at Parsons was also one of our best clones on Sewickley spoil. Of those clones Eschner listed as best for West Virginia, the twelve included in our Ohio plantings grew at least satisfactorily (41-43, 46-53, 256).

But Ohio results did not correspond completely with Eschner's. Clone 224 that did poorly in the West Virginia bottom lands was one of the better hybrids on both kinds of Ohio spoil banks (one tree was 41.4 feet tall). Also, clone 239 that failed in both West Virginia plantings was well above average in our experiment.

Among the best parents, judging from tenth-year survival and growth of the hybrids, are our own eastern cottonwood, Populus deltoides Bartr.; P. maximowiczii Henry that is native to northeast Asia and Japan; and P. nigra L., the European black poplar, and several of its cultivars, especially 'Charkowiensis' and 'Caudina.' One exception is clone 53, a cross between P. maximowiczii and the 'Caudina cultivar of P. nigra, that is cankered.

The 'Plantierensis' cultivar of P. nigra has not been satisfactory as a parent except for clone 52 that grew well on the Sewickley banks (it was troubled by canker and scale insects on the Pittsburgh banks) Most other hybrid clones that had P. nigra cv. Plantierensis as one parent are slow growing and often heavily cankered.

oplars on two spoils in Ohio after 10 years

: : Remarks
Excellent form, 10 percent of trees cankered.
Short, fine branches at acute angle, very slight canker.
Canker on 30 percent of trees but hardly a problem on Sewickley banks.
Some sweep, heavy limbs. Fifteen percent of trees badly cankered--rest unaffected.
Tends to have one dominant sprout after thinning. Very little canker.
Slight canker. Many trees 2 1/2 to 3 inches in diameter. Rather heavy branches.
Heavy limbs. Some scale insects and canker on Pittsburgh spoil. One tree 5.4 inches d.b.h.
No canker damage. Vigorous multiple sprouts on Sewickley banks. One tree 41.4 feet tall.
Very slight canker damage.
Very slight canker damage. Many sprouts 12 to 20 feet tall in 2 years.
Some self-pruning on bigger trees. Good sprouts from thinned trees.
No canker, a few small crooks, many branches but small.
No canker, sharp branch angle. Very good form (slight sweep).
Short, fine branches at acute angle. No canker.

istributed for experimental planting throughout the United States and to many other countries.

Similarly P. trichocarpa Torr. & Gray, the black cottonwood of western North America, generally seems to make a poor parent. Nearly all of its hybrid clones that we planted have many limbs or low forks and are susceptible to canker besides. Clone 42, however, grew very well on the Sewickley spoil banks.

P. x berolinensis Dipp. is a male hybrid (P. laurifolia Ledeb. x P. nigra cv. Italica) that is considered to be a canker risk (Schreiner 1959). We tried twelve clones that were crosses between this and other parents, including seven with P. maximowiczii. Two of the seven, 46 and 50, have done well so far, but the other five show poor form or susceptibility to canker. Clone 26, the single hybrid combining P. x berolinensis and P. nigra cv. Charkowiensis, was a success even though it has some canker (not serious). Among other P. x berolinensis crosses, those with P. simonii Carr. were highly cankered and those with P. balsamifera cv. Candicans grew extremely slowly.

Two other clones of the fifty evaluated failed badly, 235, a cross between P. deltoides and P. nigra cv. Incrassata, and 335, a cross between P. x berolinensis cv. Petrowskyana and P. nigra cv. Caudina.

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